Actions for Change

Improving Public Safety and the Nation's Water Resources Infrastructure

Overview Brief to the National Committee on Levee Safety

7 Oct 2008

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HQUSACE
AFC Senior Program Manager

ACTIONS for CHANGE

Actions for Change

- Background on Actions for Change (AFC)
- Key Lessons Learned from IPET
- AFC Implementation Approach
- Program Status and Looking Forward
- Questions and Discussion

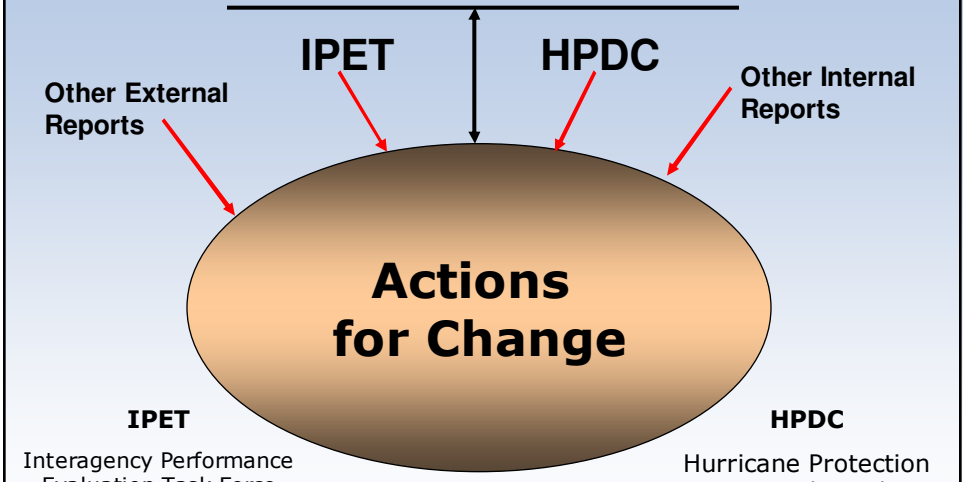
ACTIONS for CHANGE

BOTTOM LINE UP FRONT

"The Corps is responsible for the projects we build and manage, and we are accountable to the American people ……. for those who doubt us, words alone will not restore confidence. We are mindful that the public trust is earned when we follow through on our actions."

Lt. Gen. Carl A. Strock, Media event, New Orleans, 1 June 2006

USACE Campaign Plan



IPET
Interagency Performance Evaluation Task Force

HPDC
Hurricane Protection Decision Chronology

ACTIONS for CHANGE

Principal Findings, Lessons Learned and Policy Perspectives

Based on the Analyses and Insights of the Interagency Performance Evaluation Task Force

And

The Performance Evaluation of the New Orleans and Southeast Louisiana Hurricane Protection System, Volumes I-IX, September 4, 2008

Interagency Performance Evaluation Task Force ~~ IPET ~~

…"to provide credible and objective scientific and engineering answers to fundamental questions about the performance of the hurricane protection and flood damage reduction system in the New Orleans metropolitan area."
Chief of Engineers

The Hurricane Protection System	Repair and Reconstruct
The Storm	
The Performance	
The Consequences	System Risk Assessment
The Risk	

ASCE American Society of Civil Engineers

THE NATIONAL ACADEMIES Advisers to the Nation on Science, Engineering, and Medicine

The System

Key Findings

The Hurricane Protection System

- Was incomplete when Katrina hit resulting in significantly different levels of risk across NOLA
- Had sections built lower than intended from geodetic datum mis-interpretation
- Had additional loss of protection due to subsidence
- Was the sum of many individual projects separately funded, designed, constructed and operated

The HPS design criteria

- Did not change with changing hazard (NOAA redefined in 1979)
- Did not include resilience to overtopping
- Did not consider some of the failure mode that occurred
- Did not define hazard on the basis of probability

The System

Key Lessons Learned

- Planning and design of HRRS need to consider impact of component performance on entire system
- Performance must be considered for events beyond the established design criteria
- Resilience and redundancy are critical attributes for long term performance
- Dynamic factors such as the hazard, settlement, subsidence and sea level rise must be considered on a periodic basis
- All components, including pump plants and gates must be considered in planning, design and operation of any risk reduction system
- Design criteria should be updated frequently to keep up with new professional and technical knowledge and standards.
- Design storm (SPH) and historical statistical records alone are inadequate criteria for HRRS design

The Storm

Key Findings

Katrina

Created the largest surge in history of North America and equaled the largest wave height

Was a 400 year event, based on surge generation potential and joint probability of key attributes

Created unanticipated long period (16 second) waves on east side of NOLA (similar to ocean generated waves)

Surge and Waves

Overwhelmed many of the levees and floodwalls on the east side of NOLA

Caused major overtopping of levees and floodwalls in the IHNC and along the MRGO

Did not exceed design conditions along Lake Pontchartrain or in canals Storm surge at a location is highly dependent on both storm size and intensity as well as its track

The Storm

Key Lessons Learned

Sophisticated coupled surge and wave models with high resolution grids are required to reasonably estimate surge and wave conditions for engineering purposes

This same modeling capability is essential to understand the role of wetlands and barrier islands on surge and waves

Application of sophisticated models using Boussinesque approaches are needed to consider the near shore/structure impacts on surge and wave conditions

There is a need for more and resilient gages to monitor storm generated water levels and waves

Saffir-Simpson scale is an incomplete index of surge potential. Storm severity index should reflect all key characteristics of the event

Performance

Key Findings

Transitions

Were weak spots in the system; often having elevation and/or material and structural differences leading to damage or failure

Levees

Performed well until overtopping

Breaching occurred from water cascading at high velocities down the protected side causing extensive erosion

Were most vulnerable to breaching if constructed with hydraulic fill or erodable materials

Performed well with overtopping if constructed with compacted clay with a turf covering

Performance

Key Findings

Floodwalls

Failed at four sites before design water levels were reached

Failures were initiated by deflection of wall and weak or permeable underlying soils

Experienced breaching from overtopping causing erosion behind I-walls

Were designed to structural rather than geotechnical performance criteria

Pumping and Drainage

The interior drainage and pumping systems were overwhelmed by the large volume of floodwaters that entered the protected areas.

Only 16% of the combined pumping capacity remained operational during Katrina

A majority of the pumping plants were inoperable due to evacuation of operators, loss of power or flooding of the facility

In some areas floodwaters flowed through the canal and drainage network flooding areas not initially flooded directly by breaching or overtopping

Performance

Key Lessons Learned

- Hurricane Risk Reduction can only be achieved if infrastructure is designed constructed and operated as a complete system (including alignment of local, state and federal responsibilities)
- Designs should be as robust as possible to accommodate unanticipated future conditions or loadings
- Performance and capacity should be periodically reviewed with respect to dynamic aspects of the hazard, system condition and potential consequences
- Resilience to catastrophic failure should be factored into all systems
- Pumping and drainage capacity and operability is integral to overall flood risk reduction and should be considered a key part of the risk reduction system
- Maintained condition of infrastructure is critical to its performance and should be rigorously monitored by a single authority

Consequences

Key Findings

Fatalities

- Included approximately 900 (1600+ overall) in New Orleans with over 70 percent being over age of 60
- Information correlating fatalities to location and cause of death were sparse very difficult to obtain

Property

- Private Property losses (direct) were over $ 20 B
- Public property losses were an additional $ 7-8 B
- 78 % of property losses were residential (2 % industrial)
- Indirect losses dwarf the direct property losses

Environmental

- Greatest loss was 118 square miles of marsh
- Water quality was not a significant long term issue

Social / Cultural

- Only 8 of 73 neighborhoods were not flooded, 34 were totally inundated
- Loss of social fabric of community may be largest barrier to recovery

Consequences

Key Lessons Learned

- Approximately half of the direct property losses could have been averted by infrastructure resilient to catastrophic breaching.
- Resilience to catastrophic breaching would not only have saved lives and property, but also considerably eased the job of recovery
- Loss of extensive area of marshes points out the vulnerability of natural environments to large storm events and the need to consider this vulnerability when natural environments are a critical component of any risk reduction approach
- The ability to consider evacuation efficiency and effectiveness remains a challenge in consequence modeling.
- There is little information available on quantifying social and cultural impacts or their impact on recovery

Risk

Key Findings

- Repairs and strengthening since Katrina have reduced hurricane risk in selected areas
- Risk remains very high in most areas, especially to large hurricanes
- Historical statistical data are not adequate to project the future hurricane hazard
- Hurricane size and intensity must be considered along with track to estimate surge generation potential
- The return period of surge levels and flood depth may differ significantly by location and from the return period of the meteorological event that created them
- Loss of Life risk can be mitigated significantly with effective evacuation of all sectors of the population
- Property Risk can be mitigated through elevating structures, improved zoning and land use codes, storm-capable pumping (safe havens, alternative power

Risk

Key Lessons Learned

Risk assessment is an effective way to accomplish a geospatial system-wide examination of relative vulnerability to flooding and potential losses

Risk can convey a common operating picture to the public and public officials, enhancing awareness and interaction in decision making

There should be increased emphasis on use of risk in water policy. While the Corps has had risk assessment requirement for flooding since 1996 (ER 1105-2-101) it is not widely used.

Communicating risk is difficult and will require much effort, but it is essential to effective use of risk for informing the public and decision making

Current methods for regional engineering-based risk assessment are in their infancy and need additional development and refinement

Understanding uncertainty in the risk assessment process is essential to understanding the value and applicability of risk data.

Looking Forward

A Policy Perspective for the Future

Strategy: *The U.S. lacks a coherent and comprehensive strategy for water resources infrastructure. There are high levels of residual risk associated with many systems and they are typically misunderstood by public and public officials. These risks may be intolerable, but ironically we have no definition of intolerable or acceptable risk for geographically distributed systems. Many decisions are based on local priorities and do not consider regional or national issues.*

Systems: *Hurricane risk reduction is compromised by lack of systems-based and life cycle approaches. Current methods are insensitive to dynamic factors and piecemeal funding hinder completion of projects and realization of intended performance*

Looking Forward

A Policy Perspective for the Future

Standards: *The U.S. lacks clear standards for planning, design and construction of critical public works infrastructure. Current standards and guidelines do not promote long term solutions and result in infrastructure that lacks the ability to adapt for change. The 100-year defacto "standard" and terminology is inadequate and highly misleading. Risk reduction decisions should be Informed by credible and current risk and reliability Information. The U.S. needs policy that clearly enunciates acceptable, tolerable and intolerable levels of societal risk to guide critical infrastructure decisions and investments.*

Sustainability: *Understanding and exploiting natural forces and processes is a key to reducing the impact of extreme events and having a healthy environment. Sustainability also promotes systems and long-term solutions to difficult issues. It is an essential part of planning and design for the future.*

Looking Forward

A Policy Perspective for the Future

Resilience: *Lack of resilience stands out as a major factor in level of residual risk for hurricanes. Resilience against catastrophic failure should be an essential element of all public infrastructure.*

Responsibility: *A major cause of escalating risk is the increased exposure of people and property to existing natural hazards. Land use is both the problem and the solution. Dichotomy of local, state and federal authorities and roles with regard to land use has exacerbated the issue. The public must hold public officials accountable for proper land use management. Federal, state and local policies and responsibilities must be aligned to manage this major source of risk.*

Looking Forward

A Policy Perspective for the Future

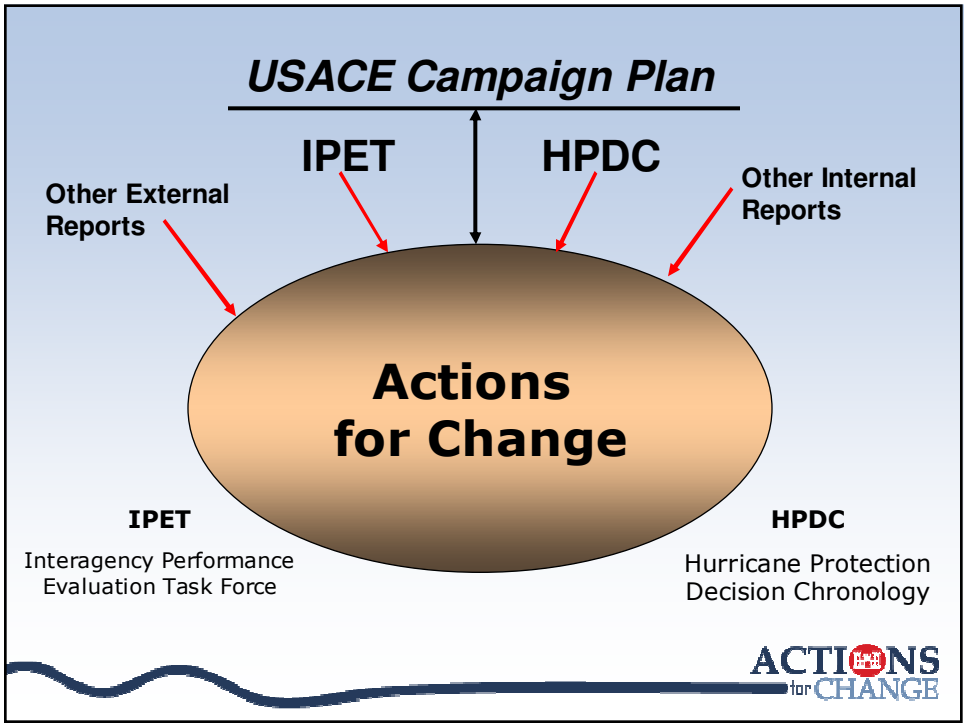
Risk: *Understanding and communicating risk information can significantly inform major planning and investment decisions, and if heeded, can significantly reduce vulnerability to losses. Risk management must first consider life-safety, the most effective mitigation being evacuation, not structures. Lack of policy clearly defining acceptable, tolerable and intolerable risk for distributed systems such as in New Orleans is a major barrier to applying risk management and supporting decision making.*

Change: *Current policy and practice do not deal well with change. We must become more agile and adapt to the expected and unexpected. Our public infrastructure must anticipate change in hazards (frequency and severity of events), systems (condition, performance requirements) and consequences (human behavior, demographics) to appropriately understand and manage residual risk. It is essential that new knowledge and technologies be quickly factored into practice and policies.*

Looking Forward

A Policy Perspective for the Future

Research: *The new body of knowledge that has emerged from the studies of Katrina are just the beginning. Much additional research is needed to enhance design criteria, understand and exploit the role of the natural environment in risk reduction, better define the hazard, assess the implications of multiple hazards, refine reliability analysis and monitor infrastructure condition and performance. This will require a long term commitment of resources and the attention of the best minds in academia, industry and government. We also know very little about the process of recovery of a major metropolitan area that has suffered a major disaster. The social and cultural implications need immediate research from the perspective of understanding societal losses as well as using that understanding to manage and stimulate recovery.*


USACE Campaign Plan
IPET
HPDC
Other External Reports
Other Internal Reports
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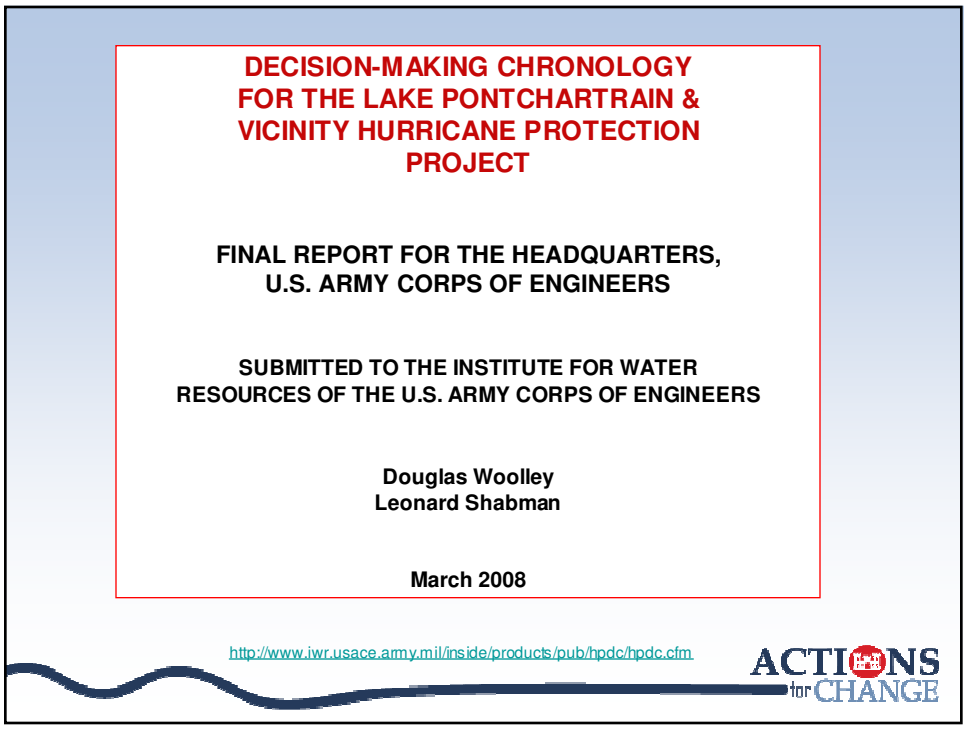
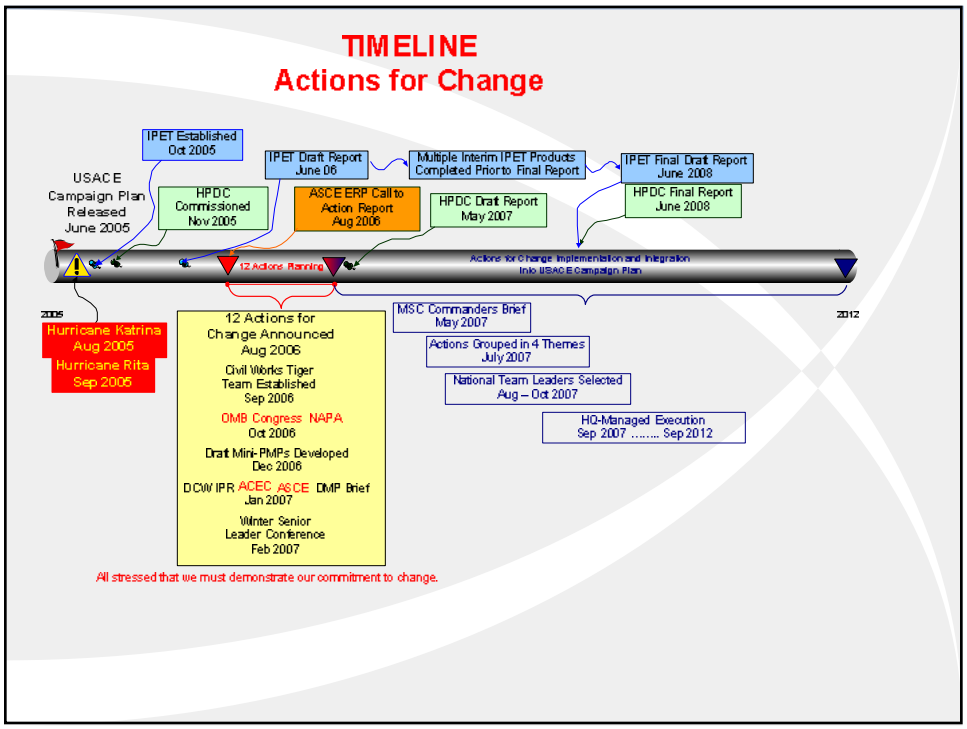

DECISION-MAKING CHRONOLOGY FOR THE LAKE PONTCHARTRAIN & VICINITY HURRICANE PROTECTION PROJECT
FINAL REPORT FOR THE HEADQUARTERS, U.S. ARMY CORPS OF ENGINEERS
SUBMITTED TO THE INSTITUTE FOR WATER RESOURCES OF THE U.S. ARMY CORPS OF ENGINEERS
Douglas Woolley
Leonard Shabman
March 2008
http://www.iwr.usace.army.mil/inside/products/pub/hpdc/hpdc.cfm
ACTIONS for CHANGE

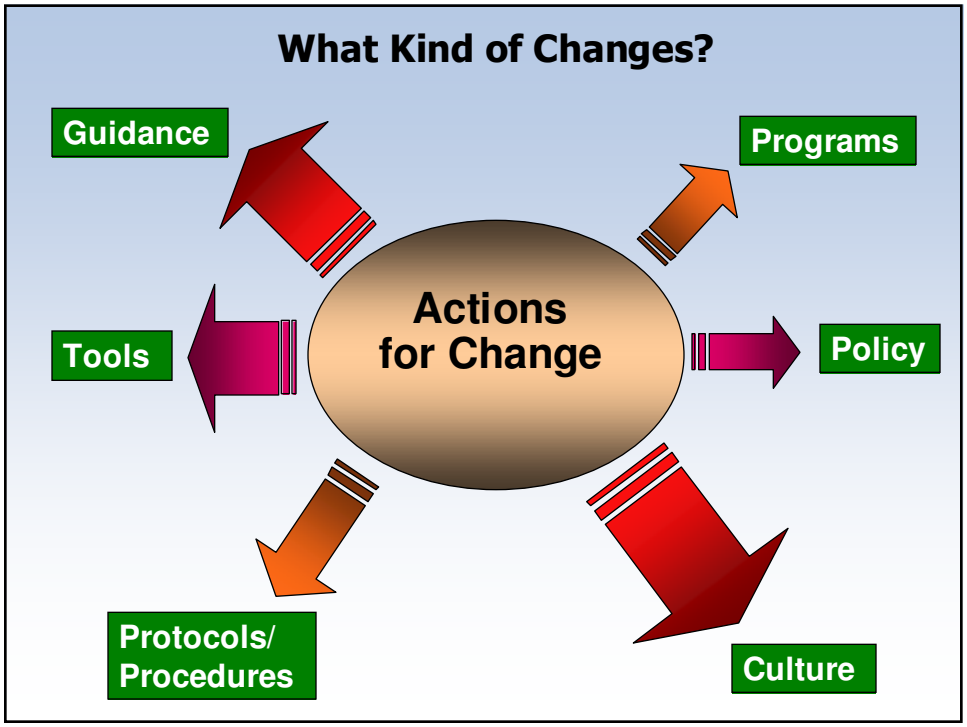
Excerpt from the HPDC Executive Summary .....While the HPDC report is critically important because of what the historical record tells us about past hurricane project decision-making in the Gulf Coast region, **it is of even greater value as a national resource and database for informing planners, decision-makers, and stakeholders on how to make better future decisions on the nation's critical public works infrastructure and the communities it serves.** Accordingly, the disclosure of the facts is being accompanied by an agency commitment to apply the lessons learned from the HPDC to inform future flood mitigation efforts and flood preparedness and response processes across the nation.

Those lessons are already being incorporated into a wide range of Corps initiatives aimed at avoiding future loss of life, human suffering, and economic losses within flood-prone areas across the nation. **Lessons from the HPDC, IPET and other ex-post investigations are now being activated through the Corps' *Actions for Change* initiative**, which represents a new direction for the Corps in terms of how it plans, decides upon, and then implements water resources management programs and projects. The *Actions for Change* incorporate not only technical considerations, but organizational, human, and social factors as well, and how they in turn impact engineering system decision processes. They emphasize the need for dynamic, risk-based decision-making within a comprehensive systems focus for the planning, design, construction, and operation and maintenance of flood and storm damage reduction projects. The *Actions for Change* call for enhanced risk assessment and communication, including periodic assessment of the potential consequences of flooding as populations at risk and potential flood hazards change over time, and openly sharing information on residual risks with project sponsors and the public. Finally, the *Actions for Change* also focus on strengthening Corps professional standards and agency commitments to technical competency and professional conduct throughout its entire workforce across the nation.

http://www.iwr.usace.army.mil/inside/products/pub/hpdc/hpdc.cfm

ACTIONS for CHANGE





12 Actions Merged to 4 Themes

- **Theme 1: Comprehensive Systems Approach**
  - Action 1: Employ integrated, comprehensive and systems-based approach
  - Action 5: Employ adaptive planning and engineering systems
  - Action 6: Focus on sustainability
- **Theme 2: Risk Informed Decision Making**
  - Action 2: Employ risk-based concepts in planning, design, construction, operations, and major maintenance
  - Action 7: Review and inspect completed works
- **Theme 3: Communication of Risk to the Public**
  - Action 9: Effectively communicate risk
  - Action 10: Establish public involvement risk reduction strategies
- **Theme 4: Professional and Technical Expertise**
  - Action 3: Continuously reassess and update policy for program development, planning guidance, design and construction standards
  - Action 4: Employ dynamic independent review
  - Action 8: Assess and modify organizational behavior
  - Action 11: Manage and enhance technical expertise and professionalism
  - Action 12: Invest in research

ACTIONS for CHANGE

Theme 1 Actions

- **Theme 1: Comprehensive Systems Approach**
  - **Action 1**: Employ integrated, comprehensive and systems-based approach
  - **Action 5**: Employ adaptive planning and engineering systems
  - **Action 6**: Focus on sustainability

- Theme 1 will emphasize an integrated, comprehensive and systems based approach incorporating anticipatory management to remain adaptable and sustainable over time that places the highest priority on protection of public health and safety. These changes require the USACE to use collaborative, adaptive planning and engineering systems throughout the project life cycle to effectively manage its aging infrastructure in an environmentally sustainable manner through explicit risk management.

ACTIONS for CHANGE

Theme 2 Actions

- **Theme 2: Risk Informed Decision Making**
  - **Action 2**: Employ risk-based concepts in planning, design, construction, operations, and major maintenance
  - **Action 7**: Review and inspect completed works

- Theme 2 will emphasize integrated risk management. These changes require the USACE to use risk and reliability concepts in planning, design, construction, operations and major maintenance and to improve its review of completed works program by including an assessment component with the goal of ensuring safe, reliable, and resilient infrastructure.

ACTIONS for CHANGE

Theme 3 Actions

- **Theme 3: Communication of Risk to the Public**
  - **Action 9:** Effectively communicate risk
  - **Action 10:** Establish public involvement risk reduction strategies

- Theme 3 will emphasize clear and candid communication of risk both internally and externally, supporting risk-informed decision making. These changes require the USACE to improve its effectiveness in communicating risk; to coordinate a risk management approach and policy with all agencies and stakeholders; and to specifically establish ways and means to increase public involvement in informed risk decision-making.

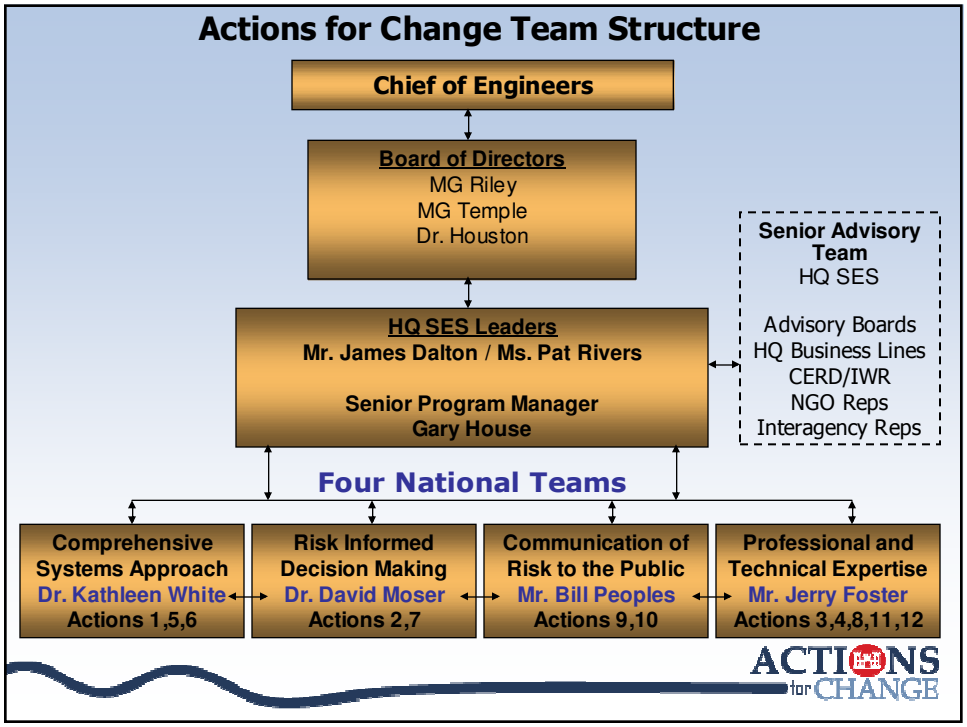
ACTIONS for CHANGE

Theme 4 Actions

- **Theme 4: Professional and Technical Expertise**
  - **Action 3:** Continuously reassess and update policy for program development, planning guidance, design and construction standards
  - **Action 4:** Employ dynamic independent review
  - **Action 8:** Assess and modify organizational behavior
  - **Action 11:** Manage and enhance technical expertise and professionalism
  - **Action 12:** Invest in research

- Theme 4 will emphasize professionalism and technical competence. In the final state, expert Corps capability will provide safe, reliable, adaptable, sustainable systems. These changes require the USACE to provide responsible and competent public service professionalism, with life safety as a fundamental driver, by improving the management and development of technical competence and professionalism.

ACTIONS for CHANGE



Makeup of the National Teams

- Multidisciplinary & cross-functional
- USACE-wide participation
- Representation external to the Corps
- Include next generation of Corps
- Leads for pilot projects or existing efforts that can provide leveraging
- Include R&D
- Active participants from other linked activities (e.g., Flood Risk Management Program)
- CoP leads

ACTIONS for CHANGE

AFC Theme 1
Comprehensive Systems Approach

- **To effect fundamental change in the US Army Corps of Engineers (USACE) by:**
  - **Developing and implementing an integrated, comprehensive and systems based approach in the execution of all our mission areas**
  - **Incorporating anticipatory management to remain adaptable and sustainable over time**
  - **Placing the highest priority on protection of public health and safety**
  - **Realizing the Corps Environmental Operating Principles**

ACTIONS for CHANGE

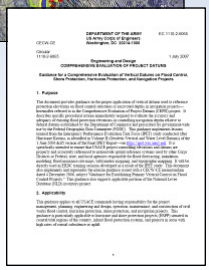
Comprehensive Systems Approach

- **What is a system?**
  - **A dynamic and complex whole interacting as a structured functional unit**
- **What is a comprehensive systems approach?**
  - **A multidisciplinary, multi-objective, and multi-stakeholder framework supporting "a balanced evaluation of all relevant issues (e.g., hydrologic, geomorphic, ecologic, social, economic)" (NRC 2004, p. 19)**
- **Corps-specific context?**
  - **Shifting the focus on making decisions from individual, isolated projects to an interdependent system, and from local or immediate solutions to regional or long-term solutions, at appropriate scales of space and time**

ACTIONS for CHANGE

Theme 1 Project Delivery Teams

- **Vertical Control**
  - "Findings of errors [from the IPET Study] of one to three feet in some of the elevations used in design, construction, maintenance, and evaluation of hurricane and flood control structures in New Orleans highlighted the need to ensure that our flood control and navigation projects across the country are referenced to the proper vertical datums…"
  - Implement a nationwide datum and subsidence standard for geodetic and water level information within USACE
  - POC Jim Garster (ERDC-TEC)



ACTIONS for CHANGE

Lieutenant General Carl A. Strock, Memorandum For Major Subordinate Commands, December 2006

Vertical Control PDT Accomplishments

- EC 1110-2-6065 "Comprehensive Evaluation of Project Datums: Guidance for a Comprehensive Evaluation of Vertical Datums on Flood Control, Shore Protection, Hurricane Protection, and Navigation Projects"
  - Develop ER and EM to replace EC
  - Currently reviewing all Engineer Manuals, Regulations, Circulars
- Initial training and certification for district datum coordinators (April/May 2007)
- Database to track the progress of projects compliance with EC 1110-2-6065 and track changes to project control, especially in subsidence areas of the country
- Prepared information for inclusion in Planning Guidance Notebook May 2008
- Report on evaluation/review of project vertical datums, to include cost to correct non-compliant projects
  - Interim report May 2008
  - Final Report July 2008

ACTIONS for CHANGE

Temporal and Spatial System Changes PDT

- **Overall charge:**
  - **ASCE post-Katrina review panel stressed need to incorporate new and changing information**
  - **Develop guidelines and recommend policy and program changes along with supporting technologies, to address dynamic processes, temporal and spatial changes and their impacts to USACE projects on watershed, regional or system scale (e.g., subsidence, climate change and variability, altered seismicity, sea level change)**
  - **POC Rolf Olsen (IWR)**


POLICYFORUM

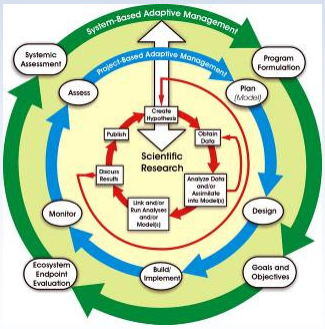
CLIMATE CHANGE

Stationarity Is Dead: Whither Water Management?

ACTIONS for CHANGE

Adaptive Management PDT

- **Overall charge:**
  - **Develop a framework for adaptive management that can be incorporated into USACE Civil Works projects to allow for flexible decision making in the face of uncertainty**
  - **Result will be a business process aimed at balancing economic, social, and ecological factors for a sustainable future**



ACTIONS for CHANGE

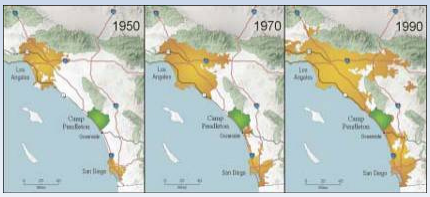
Multi-Objective System Planning and Policy PDT

- **Approach:**
  - **Planning and engineering tools for improved understanding of the system within which a proposed system component will perform**
  - **Develop a comprehensive, adaptive, systems approach for multi-objective planning that places the highest priority on protection of public health and safety**
  - **Address unanticipated consequences and impacts of cost sharing**

ACTIONS for CHANGE

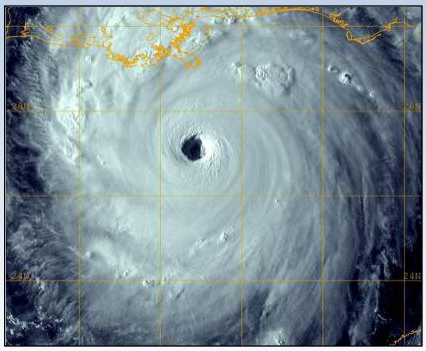
Incremental Changes to USACE Systems PDT

- **A comprehensive systems approach will direct the focus of making decisions away from individual, isolated projects to the collective evaluation of all components within an interdependent system**
- **Support comprehensive evaluation capability for incremental changes affecting USACE projects on a watershed and regional basis**
- **POC Jim Westervelt (ERDC-CERL)**



ACTIONS for CHANGE

BEFORE
Deterministic, project-based, with NED as highest priority



AFTER
Risk-based comprehensive system approach to integrated water resources management with public safety as highest priority

ACTIONS for CHANGE

Theme 2 - Risk Informed Decision Making

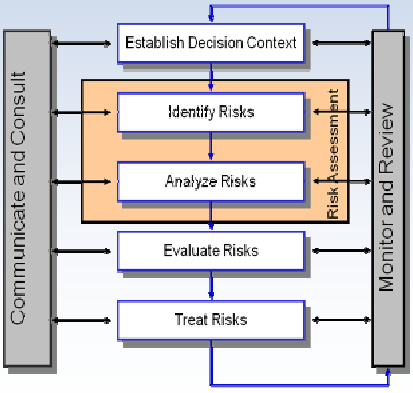
Infuse risk assessment and risk management into the life-cycle of a CW project

- Recognize all risks
  - property, people, economy, environment, and cultural impacts
- Acknowledge uncertainty
- Collaborate with stakeholders throughout

ACTIONS for CHANGE

Risk Management

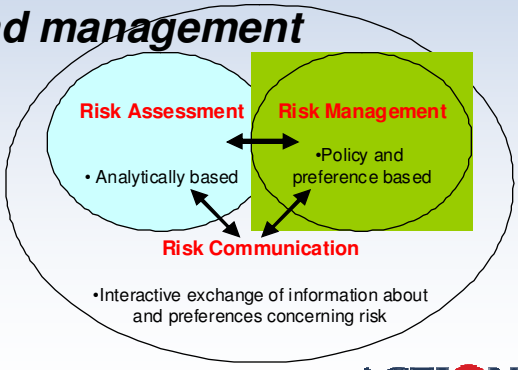
- **The process of identifying the problem and taking action to alter levels of risk**



ACTIONS for CHANGE

Risk Analysis

- ***Theme 2 tasks organized around risk analysis framework with focus on assessment and management***



ACTIONS for CHANGE

Language is Important

- ***When federal officials repeatedly refer to "100 year" floods and levees designed to protect against them, they mislead people into thinking that such storms are once-in-a-lifetime events. Whatever statistical validity these terms ever had, they no longer serve the public, and the government would do better to drop them.***

USA Today, 8 July 2008

ACTIONS for CHANGE

Development of Flood Risk Management Tools

- **Background**
  - Existing analysis tools are not system based and do not include a full range of flooding consequences. NRC panel recommended some improvements in 2000 report
- **Objective**
  - Develop conceptual strategy and methodology for a new flood damage analysis tool to align with the NRC recommendations and the Actions for Change.
  - This new software should be able to analyze the engineering and operational reliability of local protection systems as systems and to estimate consequences beyond economics to include loss of life.
- **Lead: Mike Deering--HEC**

ACTIONS for CHANGE

Life-Cycle Risk Analysis Framework

- **Background**
  - Risk approaches are not universally available to assist complex decision-making. As a result, the significance of life safety, social, environmental, and economic consequences have not been fully considered, resulting in a less-informed set of solutions from which to select. Also, there are many different decision-makers on the different measures and components of the solution, and thus their values and objectives need to be put into context with other stakeholders.
- **Objective**
  - To develop a comprehensive, multidisciplinary approach to integration of risk concepts in planning, engineering, operations, and emergency management, with the focus on a tool and process to allow decision-makers to see impacts on the full range of objectives.
- **Lead: Todd Bridges—ERDC and David Moser—IWR**

ACTIONS for CHANGE

Risk Technology Workshops

- **Background**
  - The Corps has been doing risk assessments as part of flood risk management and major rehabilitation since 1992. These have introduced risk methods but the results have typically only been used based on expected values and single metrics. More extensive use of risk assessments to manage risks will be part of the way the Corps does business in the future.
- **Objective**
  - Risk informed decision making is new to the Corps. All Corps personnel need to be informed and educated on the basics of what will be expected in the future.
  - Training will include 2-hour executive level
- **Lead: Brian Harper-- IWR**

ACTIONS for CHANGE

Tolerable Risk Policy

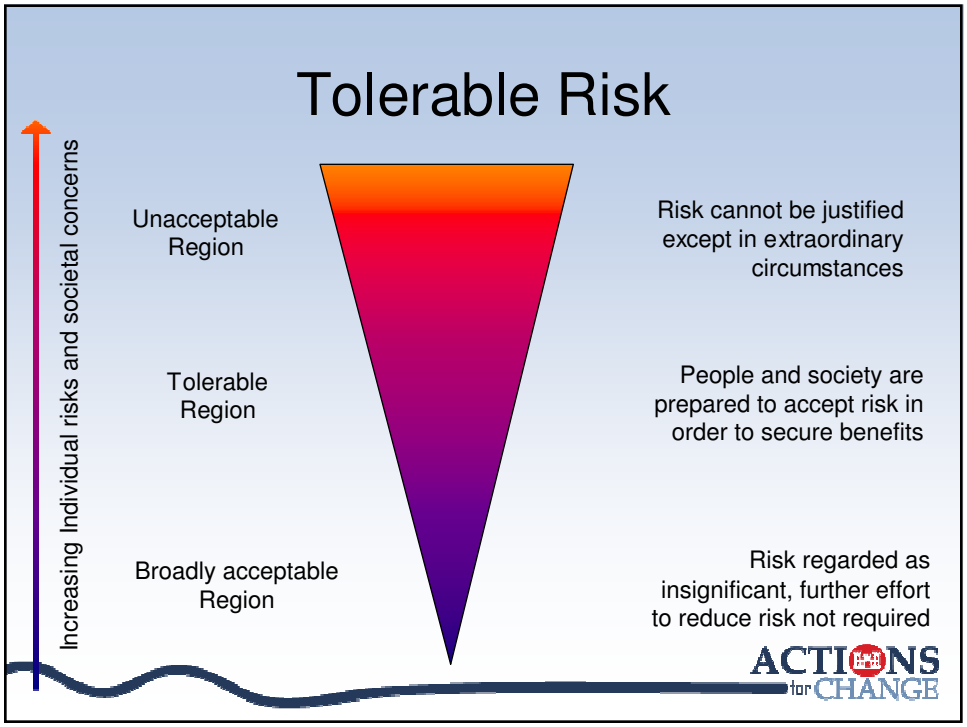
- **Background**
  - Tolerable risk is a concept used to inform risk management decisions. Establishing tolerable risk involves balancing the fundamental competing principles of equity, the right of individuals and society to be protected, and efficiency, the need that society has to distribute and use its available resources in such as way as to gain maximum benefit. Tolerable risk guidelines are used to guide the process of examining and judging the significance of risk and in managing the risk
- **Objective**
  - To develop and appropriately implement tolerable risk policy to aid Corps decisions, primary related to dams and levees.
- **Lead: Brian Harper and David Moser—IWR**

ACTIONS for CHANGE

Tolerable Risk Policy

- **Status**
  - International workshop on tolerable risk held in Alexandria, VA 18-19 March 2008 sponsored by USCE, USBR, and FERC
  - Draft interim tolerable risk policy for dam safety—Draft completed July 2008
  - Continuing development for dams and levees

ACTIONS for CHANGE



Levee Risk Assessment Methodology, Policy and Procedures

- **Background**
  - Levee inspection was an issue identified by IPET. Risk analysis methods and tools specifically for levees are not available to assist complex decision-making regarding levees. The Corps of Engineers has approximately 2,000 miles of levees in its nationwide portfolio and approximately 10,000 miles of levees USACE has constructed and turned over to locals for O&M. However, USACE has minimal tools, policies, and procedures to implement a sustainable approach to levee risk management.
- **Objective**
  - This effort will develop comprehensive, tools, policies, and procedures to implement a robust Corps of Engineers Levee Safety Program. Products will provide a foundation for the Corps of Engineers' Levee Safety Program.
- **Lead: Michael Bart—MVP**

ACTIONS for CHANGE

Reassess Levee Failure Mechanisms Based on IPET

- **Background**
  - Investigations of the hurricane protection systems in Louisiana identified possible deficiencies in the guidance used to design I-walls. The (USACE) issued directed guidance regarding these deficiencies in a memorandum to MSC's. USACE needs to develop, peer review and deploy Detailed Evaluation Guidance for I-walls that pose risk of not performing as designed
- **Objective**
  - To develop the engineering and science to provide more definitive detailed guidance on dealing with I-wall performance across the nation. The approach is intended to be used for existing and any new I-walls across the country.
- **Lead: Kent Hokens—MVP and Anjana Chudgar—HQUSACE**

ACTIONS for CHANGE

Reassess Levee Failure Mechanisms Based on IPET

- **Status**
  - PDT formed Nov 2007
  - Numerical model for I-wall performance under development
  - Test site soil investigations for data underway

ACTIONS for CHANGE

Theme 3 - Communication of Risk to the Public

Mission

- **To effect fundamental improvement in the way USACE communicates risk and involves the public**
- **Develop and implement Risk Communication and Public Involvement policy, guidance and training across USACE mission areas**
  - **Incorporate "best practices" ….. USACE, other government agencies and the private sector in order to be sustainable over time**
  - **Place the highest priority on protection of public health and safety**
  - **Consistent with the Corps Communication Principles**

ACTIONS for CHANGE

Communication of Risk to the Public

Deliverables

- Action 9 - Risk Communication
  - 9a. Methods to Communicate Risk
  - 9b. Risk Communication Guidance
  - 9c. Infuse Understanding of Risk
  - 9d. Risk Communication Pilots
- Action 10 - Establish Public Involvement Risk Reduction Strategies
  - 10a. Public Involvement Framework
  - 10b. Residual Risk Education
  - 10c. External Advisory Committee
  - 10d. Public Involvement Pilots

ACTIONS for CHANGE

Theme 4 - Professional and Technical Expertise

Action 3: Continuously reassess and update policy for program development, planning guidance, design and construction standards

Action 4: Employ dynamic independent review

Action 8: Assess and modify organizational behavior

Action 11: Manage and enhance technical expertise and professionalism

Action 12: Invest in research

ACTIONS for CHANGE

National Technical Competency Strategy (NTCS) – 6 Steps

1. Establish and resource a National Technical Competency Team (NTCT)
2. Identify future USACE missions, roles and methods of delivery
3. Determine competencies and level of technical capabilities to support these future roles.
4. Identify gaps between current and future competency and capability requirements
5. Develop short-term strategy and transition plan.
6. Develop USACE recruitment, hiring, development, and retention strategy.

ACTIONS for CHANGE

Summary

ACTIONS for CHANGE

Actions for Change Summary

- USACE is a proud organization with a rich history of providing solid and trustworthy engineering and constructions services to the Army and the Nation
- Hurricanes Katrina and Rita, the disaster in New Orleans, and the rigorous assessments that followed, exposed a number of significant areas for improvement in our policies and practices …. "*a sobering wake-up call"*
- USACE's credibility was damaged, and we are accountable to the public
- Through ***Actions for Change***, USACE will take the lessons learned from Katrina and apply disciplined thought and action over a 3-5 year period, using dedicated resources, to make fundamental changes in the way we plan, design, construct and maintain our infrastructure
- Through many specific activities and products (policy, guidance, engineering tools, and research) USACE will: expand our use of systems-based approaches, make more use of risk management in our business practices and decision making, communicate risk more effectively, and give greater priority to technical competence and professional accountability
- Actions for Change will be a key initiative in support of the agency's overall strategic goals and USACE's journey from "Good to Great."

ACTIONS for CHANGE

Actions for Change
Online Resources

Engineer Update Overview Article – Feb 2008
http://www.hq.usace.army.mil/cepa/pubs/feb08/story7.htm

Engineer Update Theme 1 Article – March 2008
http://www.hq.usace.army.mil/cepa/pubs/mar08/story11.htm

Engineer Update Theme 2 Article – May 2008
http://www.hq.usace.army.mil/cepa/pubs/may08/story7.htm

Engineer Update Theme 3 Article – July 2008
http://www.hq.usace.army.mil/cepa/pubs/July08/story7.htm

Actions for Change Website
https://maps.crrel.usace.army.mil/AFC/
(only available inside the USACE firewall at this time)

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ACTIONS for CHANGE

Actions for Change Simplified

1 of 5

Action	Goal	Change	Process
Systems-based Approach	**Integrated, comprehensive, risk-aware, system-wide solutions**	Organizational focus from project-specific to system-based	Create policy, budgeting, culture, and tools to enable change
Risk-informed decision support	**Provide effective investments that incorporate life safety as key criteria**	Use risk and reliability methods for evaluation of alternatives	Develop risk and reliability assessment policy, tools, training, and communication
Continuous update of criteria & standards	**Safe, reliable, resilient, and adaptive systems**	Sustainable review and update processes	Set up & fund continuous review and update
Independent and dynamic review	**To assure safe, reliable, resilient, and adaptive systems**	Improve internal and external review processes	Review existing implementation, engage outside organizations to develop improved process and guidelines

ACTIONS for CHANGE

Actions for Change Simplified

2 of 5

Action	Goal	Change	Process
Adaptive planning and engineering	**To maintain safe, reliable, and resilient service.**	The way new information and knowledge is incorporated into a project/system life cycle	Periodically assess performance to execute necessary improvements. Develop innovative technologies and processes that build needed flexibilities into design, operation of projects/systems.
Sustainability	**Effectively manage aging infrastructure in environmentally sustainable manner**	Prioritization of investments in infrastructure maintenance. Include the environment as an integral system component	Develop and utilize methods to incorporate risk into decisions. Explicitly leverage environmental components into decision-making process

ACTIONS for CHANGE

Actions for Change Simplified

3 of 5

Action	Goal	Change	Process
Review and Inspect Completed Works	**Effective inspection and assessment program to ensure safe, reliable, and resilient infrastructure**	Change from reconnaissance level inspections to a periodic in-depth risk assessment of all system infrastructure, Corps and non-Corps	Integrate FEMA, state and other agencies into process. Integration of ongoing asset inventory and assessment methodologies being developed
Improve Organizational Behavior	**Professionalism and accountability in organizational execution and decision-making**	Balance competing interests so that the public safety is held paramount in organizational decision-making.	Develop system of accountability at all levels of the organization. Identify national technical specialists for critical systems.

ACTIONS for CHANGE

Actions for Change Simplified

4 of 5

Step	Goal	Change	Action
Communicate risk	**Public and Corps understanding of risk in decision-making.** **Internal Operating Procedures**	Proactive education of public and Corps	Develop communication plan and implement with Federal and stakeholders. Examine methods and successes other, non-flood hazards.
Involve public in risk reduction	**Achieve coordination of a risk management strategy and policy with all agencies to insure active public participation.**	Align national strategies for risk management and collaborative decision-making processes	Conduct national dialogues. Develop collaborative decision-making tools.

ACTIONS for CHANGE

Actions for Change Simplified

5 of 5

Step	Goal	Change	Action
Increase Technical Expertise	**Use state-of-the-art methods and technology to provide safe, efficient, and quality projects.** **Develop and maintain superior national workforce capability**	Recommitment to maintaining technical and ethical professionalism throughout the workforce. Increase and promote opportunities for all technical staff to further their professional development.	Invest in tech transfer and innovation in practice. Revisit entire training program and priorities. Initiate technical support programs for all business lines.
Invest in Research	**Focus and link research to future needs of the projects and the nation**	Balanced investment strategy between basic and applied research. Increase field involvement in setting priorities and infusing technology.	Reinvigorate R&D program /funding to incorporate continuous reassessment of needs.

ACTIONS for CHANGE

Background Slides

IPET's Overarching Lessons Learned

- Resilience
- System Performance
- Risk and Reliability
- Knowledge, Technology and Expertise

AFC Tasks Closely Related to Levees

1b. Identify and develop the system toolset to provide analyses and decision support across projects and emphasize life safety in the other social effects (OSE) account; include regional economic development (RED) and national ecosystem restoration (NER) along with national economic development (NED). Initiate action to legislate life safety as the dominant consequence of concern. Emphasize nonstructural project/system alternatives that reduce life safety risk and provide environmental benefits

2a. Update HEC software for risk-based planning and incorporate HEC-FDA into the HEC-WAT (Watershed Analysis Tool). Add new capability to perform risk and uncertainty for nonstructural flood damage reduction measures. Add capability for agricultural damages in HEC-FDA, plus the risk and uncertainty about those damages and the inclusion of project costs and the risk and uncertainty about those costs.

2e. Conduct workshop at each Corps District to communicate residual risk associated with levees and demonstrate performance of levee certifications using Risk Analysis, HEC-FDA, and other appropriate tools. Develop training materials for multiple disciplines including H&H, geotech, and structural engineers and include train-the-trainer component to increase knowledge transfer. Transition to training program.

ACTIONS for CHANGE

AFC Tasks Closely Related to Levees

3b. Update guidance specifically to incorporate resilient safeguard features, components and details that will preclude rapid formation of failure mechanisms in an overload condition. Require scour protection on the landside of floodwalls and levees to resist erosion damage due to overtopping. Include changes in the estimated surge and wave forces and corresponding performance criteria for increasing intensity of hurricanes (Category 2 to Category 5), and change the I-wall and levee criteria to include all potential failure modes according to the IPET results. Revisit changes in safety factors within the context of site investigation, testing and shear strength selection, analysis method, and minimum estimated safety factors.

3d. Continue progress on national policy on tolerable risk levels. Begin to develop policy and guidance on risk thresholds.

ACTIONS for CHANGE

Research Related to Levees

12a. Integrate existing technologies for rapid characterization of levee, dike, dam, and floodwall stability under a variety of loadings ranging from static to dynamic, detailed structural evaluation of critical infrastructure components. Investigate existing high quality data sets of physical systems and prioritize future acquisition.
12b. Integrate existing technologies for rapid cost-effective, and sustainable protection of levees and dikes from backside erosion by waves and overtopping.
12c. Develop and field-test sustainable emergency repair protocols and techniques for flood damage reduction infrastructure for broad range of structure classes and situations.
12d. Advance the understanding of the physics of breaching mechanisms in levees, floodwalls, and shore protection including overtopping, gap mechanisms, erosion; develop engineering model of failure during extreme events; develop sustainable remedial actions.
12e. Advance the understanding of the physics of creating fragility curves to model the risk and reliability effects of surge and overtopping including any dynamic effects; include hydrofracturing due to crack formation.

ACTIONS for CHANGE

Talking Points - Actions for Change

- The Actions for Change are a set of actions the Corps will focus on to transform its priorities, processes, and planning to better serve the nation and its Armed Forces across all our mission areas.
- Driven by the Hurricane Katrina disaster, the primary goals of the Actions are to improve public safety and the Corps' water resources infrastructure.
- Several Actions have implications for MP (Technical Competence, Adaptive Management , Sustainability, Risk Management)
- The Actions will include a more rigorous focus on risk analysis in the planning, design, construction and maintenance of safe, reliable, sustainable systems.
- We will use dynamic reviews to assure public safety and broaden public involvement and acceptance.
- The 12 Actions have been divided into 4 themes; each theme will be implemented by a national team that reports to HQ
- Each MSC will play a quality assurance role for one or two of the Actions.

ACTIONS for CHANGE

Actions for Change
Bottom Line Up Front

"The Corps is responsible for the projects we build and manage, and we are accountable to the American people ….. for those who doubt us, words alone will not restore confidence. We are mindful that the public trust is earned when we follow through on our actions."

- **Lieutenant General Strock**

"Deliver."

- **Lieutenant General Van Antwerp**

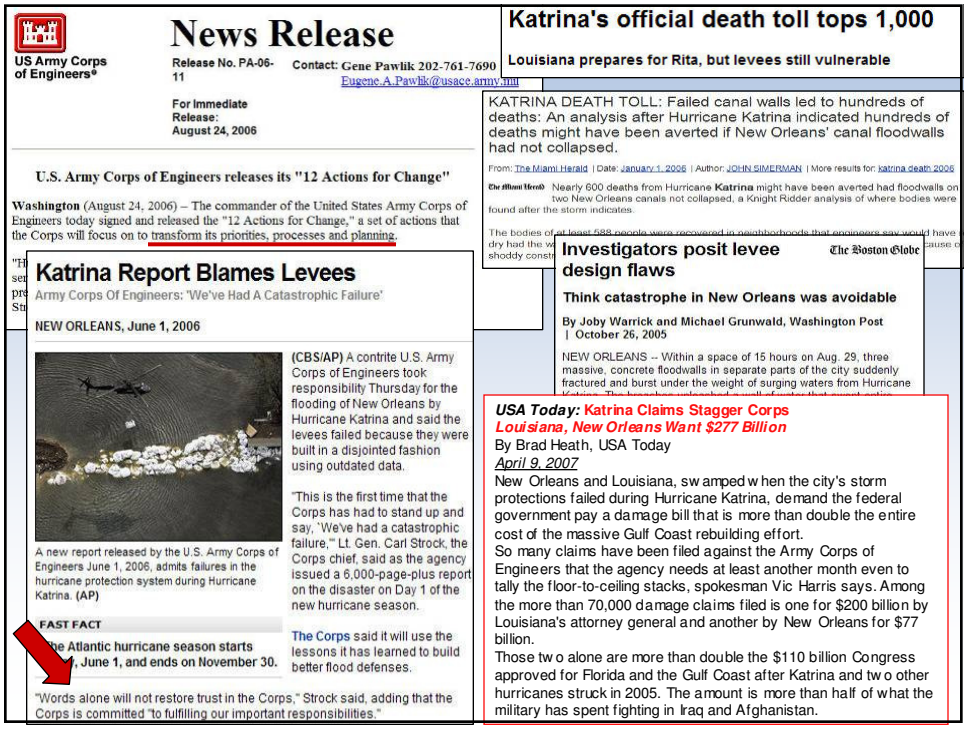
ACTIONS for CHANGE

Rebuilding America Special Report: How to Fix U.S. Infrastructure – Popular Mechanics May 2008

"The urgent pace is the only sign of the collapse of the old I-35W bridge, which occurred on this spot six months ago. The debris was quickly cleared away, and in the aftermath, the Minnesota Department of Transportation (Mn/DOT) pledged to open a new bridge by Dec. 24, 2008. In a business where it can take years just to get a permit, this is an improbably ambitious schedule. 'We know that eyes are on us, but that's a good thing,' says John Chiglo, Mn/DOT's manager for the project. '**Re-establishing public trust is something we felt needed to be done. Something was lost that day, when the bridge collapsed**.'

"And not just in Minnesota. To many Americans, the I-35W disaster wasn't an isolated tragedy, **but the latest in a barrage of infrastructure failures — from the northeastern blackout in 2003 and the breached New Orleans levees in 2005 to falling concrete in Boston's Big Dig in 2006.** Perhaps the nation had passed a tipping point and was entering a period of steep physical decline."

ACTIONS for CHANGE



US Army Corps of Engineers®

News Release

Release No. PA-06-11

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For Immediate Release:
August 24, 2006

U.S. Army Corps of Engineers releases its "12 Actions for Change"

Washington (August 24, 2006) – The commander of the United States Army Corps of Engineers today signed and released the "12 Actions for Change," a set of actions that the Corps will focus on to transform its priorities, processes and planning.

Katrina's official death toll tops 1,000

Louisiana prepares for Rita, but levees still vulnerable

KATRINA DEATH TOLL: Failed canal walls led to hundreds of deaths: An analysis after Hurricane Katrina indicated hundreds of deaths might have been averted if New Orleans' canal floodwalls had not collapsed.

From: The Miami Herald | Date: January 1, 2006 | Author: JOHN SIMERMAN | More results for: katrina death 2006

The Miami Herald Nearly 600 deaths from Hurricane **Katrina** might have been averted had floodwalls on two New Orleans canals not collapsed, a Knight Ridder analysis of where bodies were found after the storm indicates.

The bodies of at least 588 people were recovered in neighborhoods that engineers say would have dry had the w... shoddy constr... cause o...

Katrina Report Blames Levees

Army Corps Of Engineers: 'We've Had A Catastrophic Failure'

NEW ORLEANS, June 1, 2006

A new report released by the U.S. Army Corps of Engineers June 1, 2006, admits failures in the hurricane protection system during Hurricane Katrina. (AP)

(CBS/AP) A contrite U.S. Army Corps of Engineers took responsibility Thursday for the flooding of New Orleans by Hurricane Katrina and said the levees failed because they were built in a disjointed fashion using outdated data.

"This is the first time that the Corps has had to stand up and say, 'We've had a catastrophic failure,'" Lt. Gen. Carl Strock, the Corps chief, said as the agency issued a 6,000-page-plus report on the disaster on Day 1 of the new hurricane season.

FAST FACT

...e Atlantic hurricane season starts ..., June 1, and ends on November 30.

The Corps said it will use the lessons it has learned to build better flood defenses.

"Words alone will not restore trust in the Corps," Strock said, adding that the Corps is committed "to fulfilling our important responsibilities."

Investigators posit levee design flaws

The Boston Globe

Think catastrophe in New Orleans was avoidable

By Joby Warrick and Michael Grunwald, Washington Post | October 26, 2005

NEW ORLEANS -- Within a space of 15 hours on Aug. 29, three massive, concrete floodwalls in separate parts of the city suddenly fractured and burst under the weight of surging waters from Hurricane ...

***USA Today:* Katrina Claims Stagger Corps**
Louisiana, New Orleans Want $277 Billion
By Brad Heath, USA Today
April 9, 2007

New Orleans and Louisiana, swamped when the city's storm protections failed during Hurricane Katrina, demand the federal government pay a damage bill that is more than double the entire cost of the massive Gulf Coast rebuilding effort.

So many claims have been filed against the Army Corps of Engineers that the agency needs at least another month even to tally the floor-to-ceiling stacks, spokesman Vic Harris says. Among the more than 70,000 damage claims filed is one for $200 billion by Louisiana's attorney general and another by New Orleans for $77 billion.

Those two alone are more than double the $110 billion Congress approved for Florida and the Gulf Coast after Katrina and two other hurricanes struck in 2005. The amount is more than half of what the military has spent fighting in Iraq and Afghanistan.

Actions for Change

1. Employ an Integrated Comprehensive Systems-Based Approach
2. Employ Risk-Based Concepts in Planning, Design, Construction, and Major Maintenance
3. Continuously Reassess and Update Policy for Program Development, Planning Guidance, Design and Construction Standards
4. Dynamic Independent Review
5. Employ Adaptive Planning and Engineering Systems
6. Focus on Sustainability
7. Review and Inspect Completed Works
8. Assess and Modify Organizational Behavior
9. Effectively Communicate Risk
10. Establish Public Involvement Risk Reduction Strategies
11. Manage and Enhance Technical Expertise and Professionalism
12. Invest in Research and Development

MSC Roles and Responsibilities

- Provide "ITR" of implementation plan and products for the assigned Action Theme
- Primary proponent for implementing the changes coming from the AFC program

1 Comprehensive Systems Approach
LRD, SWD, POD

3 Communication of Risk to the Public
MVD, SPD

2 Risk Informed Decision Making
LRD, NWD, SPD

4 Professional and Technical Expertise
ERDC, SAD, NAD

ACTIONS for CHANGE